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Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b)

Attorney Docket No. 004860.P2449 Total Pages 3

First Named Inventor or Application Identifier Peter Krause

Express Mail Label No. EL639015427US

ADDRESS TO: **Assistant Commissioner for Patents**
Box Patent Application
Washington, D. C. 20231

APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents.

1. XX Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)

2. XX Specification (Total Pages 16)
(preferred arrangement set forth below)
- Descriptive Title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claims
- Abstract of the Disclosure

3. X Drawings(s) (35 USC 113) (Total Sheets 7)

4. X Oath or Declaration (Total Pages 5)

a. X Newly Executed (Original or Copy)

b. ___ Copy from a Prior Application (37 CFR 1.63(d))
(for Continuation/Divisional with Box 17 completed) **(Note Box 5 below)**

i. ___ DELETIONS OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).

5. ____ Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ____ Microfiche Computer Program (Appendix)

7. _____ Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
a. ____ Computer Readable Copy
b. ____ Paper Copy (identical to computer copy)
c. ____ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. __X__ Assignment Papers (cover sheet & documents(s))
9. _____ a. 37 CFR 3.73(b) Statement (where there is an assignee)
_____ b. Power of Attorney
10. _____ English Translation Document (if applicable)
11. _____ a. Information Disclosure Statement (IDS)/PTO-1449
_____ b. Copies of IDS Citations
12. _____ Preliminary Amendment
13. __X__ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
14. _____ a. Small Entity Statement(s)
b. Statement filed in prior application, Status still proper and desired
15. _____ Certified Copy of Priority Document(s) (if foreign priority is claimed)
16. __X__ Other: Express Mail Certification

17. **If a CONTINUING APPLICATION,** check appropriate box and supply the requisite information:
___ Continuation ____ Divisional ____ Continuation-in-part (CIP)
of prior application No: _

18. **Correspondence Address**
_____ Customer Number or Bar Code Label _____
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or
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Respectfully submitted,

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"Express Mail" mailing label number: EL639015427US
Date of Deposit: September 7, 2000
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Carrie Boccaccini
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_____
(Signature of person mailing paper or fee)
9-7-2000
(Date signed)

Serial/Patent No.: **** Filing/Issue Date: Herewith
Client: Apple Computer, Inc.
Title: POWER DISTRIBUTION SYSTEM

BSTZ File No.: 004860.P2449 Atty/Secty Initials: ACC/cab
Date Mailed: September 7, 2000 Docket Due Date: ****

The following has been received in the U.S. Patent & Trademark Office on the date stamped hereon:

- ☐ Amendment/Response (____ pgs.)
- ☐ Appeal Brief (____ pgs.) (in triplicate)
- ■ Application - Utility (16 pgs., with cover and abstract)
- ☐ Application - Rule 1.53(b) Continuation (____ pgs.)
- ☐ Application - Rule 1.53(b) Divisional (____ pgs.)
- ☐ Application - Rule 1.53(b) CIP (____ pgs.)
- ☐ Application - Rule 1.53(d) CPA Transmittal (____ pgs.)
- ☐ Application - Design (____ pgs.)
- ☐ Application - PCT (____ pgs.)
- ☐ Application - Provisional (____ pgs.)
- ■ Assignment and Cover Sheet
- ■ Certificate of Mailing
- ■ Declaration & POA (5 pgs.) (signed)
- ☐ Disclosure Docs & Org & Copy of Inventor's Signed Letter (____ pgs)
- ■ Drawings: 7 # of sheets includes 8 figures
- ■ Express Mail No.: EL639015427US
- ☐ ____ Month(s) Extension of Time
- ☐ Information Disclosure Statement & PTO-449 (__ pgs.)
- ☐ Issue Fee Transmittal
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- ☐ Petition for Extension of Time
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- ☐ Power of Attorney (____ pgs.)
- ☐ Preliminary Amendment (____ pgs.)
- ☐ Reply Brief (____ pgs.)
- ☐ Response to Notice of Missing Parts
- ☐ Small Entity Declaration for Indep. Inventor/Small Business
- ■ Transmittal Letter, in duplicate
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- ■ Check No. 37518 Amt: $730.00
- ☐ Check No. _____ Amt: _____

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EL639015427US

UNITED STATES PATENT APPLICATION

for

POWER DISTRIBUTION SYSTEM

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9-7-2000
(Date signed)

POWER DISTRIBUTION SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to power supply topographies, and more specifically to power supply topographies for digital processing systems.

Background Information

It is well known that digital processing systems, such as personal computer systems, require a power supply in order to operate. In fact, it is common for the display device (e.g., video monitor) and central processing unit (CPU) of a "separated" personal computer system to be powered by separate power supplies. In a separated personal computer system, the display device is separate from the housing containing the CPU.

Even in "all-in-one" personal computer systems, in which the display device and CPU are housed in the same enclosure, a separate power supply is used for each of the display device and the CPU. In all-in-one computer systems, the power supply for the CPU is not necessarily located on the same printed circuit board that features the CPU which is located at main logic board (MLB). If the power supply is not located on the MLB along with the CPU, a group of cables is needed to connect such an off-board power supply to the MLB such that the necessary voltages can be supplied to components, such as the CPU, on the MLB. However, the cables used to connect the power supply to the MLB are not only relatively large and costly but they also require a noise rejecting filter to be placed at the junction between the cables and the MLB. Thus, using an off-board power supply and associated cables increases the cost and complexity of the system.

A commonly used power supply for a display device is a flyback converter. Flyback converters are generally used to generate relatively high voltages at low current. A basic circuit diagram of a flyback converter is shown in **Figure 1A**. In a flyback converter, energy is stored in a transformer 105 during the power switch on time. During such time, the load current is supplied from an output filter capacitor 110. When the power transistor turns off, the energy stored in the power transformer 105 is transferred to the output load and replenishes the charge in the filter capacitor 110. A controller circuit 115 provides the necessary control and drive signals (base/gate drive signals) for switch 120. Diode 125 and capacitor 130 represent a conventional bridge rectification and capacitive filter needed to produce a high voltage DC supply for the flyback converter.

A commonly used power supply for a CPU is a forward converter, which is also referred to as a down converter. Forward converters are generally used to generate relatively low voltages at high current. A basic circuit diagram of a forward converter is shown in **Figure 1B**. A forward converter is a switching power supply in which the energy is transferred from the input to the output during the on state of the primary switching device 150. A winding 155 of transformer 160 is phased so that energy will be transferred to the output and stored in the output choke 165 when the power transistor is on. When the power transistor turns off, the energy stored in the output choke is transfer to the output load. A controller circuit 180 provides the necessary control and drive signals (base/gate drive signals) for switch 150.

Generally, two independent power supplies are used to generate the power needed to drive a display and a CPU in an all-in-one computer system. The independent power supplies typically share only a few components related to the AC input and the AC electromagnetic compatibility (EMC) filter circuitry. **Figure 1C** illustrates a basic block diagram of two independent power supplies 185 and 190 which provide power to a display 187 and a CPU (not shown) located on a printed circuit

board, such as main logic board (MLB) 195. The independent power supply which drives the display 187 is a flyback converter 185, and the independent power supply which drives the CPU is a forward converter 190. Forward converter 190 is shown located apart from MLB 195. Thus, a group of cables 191 is needed to connect forward converter 190 to MLB 195 such that the necessary voltages can be supplied to components on MLB 195. A noise rejecting filter 193 is used at the junction between cables 191 and MLB 195.

SUMMARY OF THE INVENTION

The present invention provides a power supply circuit for a digital processing system. In one embodiment of the present invention, the power supply circuit includes a first stage associated with a first component of the digital processing system, and a second stage associated with a second component of the digital processing system. The first stage drives the second stage.

In another embodiment, the first component comprises a display device and is powered by the first stage, and the second component comprises a CPU and is powered by the second stage. The first stage includes a flyback converter and the second stage includes a portion of a forward converter.

Additional features and benefits of the present invention will become apparent upon review of the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

Various embodiments of the present invention will be described in detail with reference to the following drawings. The present invention is illustrated by way of example and not limitation in the accompanying figures.

Figure 1A illustrates generally a circuit diagram of a flyback converter.

Figure 1B illustrates generally a circuit diagram of a forward converter.

Figure 1C illustrates a basic block diagram of a prior art power supply topography for a computer system.

Figure 2 illustrates a basic block diagram of a power supply topography for a computer system in accordance with the teachings of the present invention.

Figure 3 illustrates a circuit diagram of a power supply circuit in accordance with the teachings of the present invention.

Figure 4 illustrates generally an internal side view of an all-in-one computer system having a two stage power supply circuit in accordance with the teachings of the present invention.

Figure 5A illustrates a transformer which may be used in the first stage of a power supply circuit in accordance with the teachings of the present invention.

Figure 5B illustrates a transformer which may be used in the second stage of a power supply circuit in accordance with the teachings of the present invention.

DETAILED DESCRIPTION

The following description provides embodiments of the present invention. However, it will be appreciated that other embodiments of the present invention will become apparent to those of ordinary skill in the art upon examination of this description. Thus, the present description and accompanying drawings are for purposes of illustration and are not to be used to construe the invention in a restrictive manner.

A first stage of a power supply circuit is used to generate the power needed to drive a display and a main logic board in an all-in-one computer system. In one embodiment of the present invention, the first stage is a flyback converter which is used to generate the supply voltages for the display. A second stage of the power supply circuit is driven by the first stage to provide power to components, such as the central processing unit (CPU), on the main logic board (MLB). In one embodiment of the present invention, the second stage is the final stage of a forward converter. The second stage is compact enough to be mounted directly onto the MLB to provide more direct power distribution to the components on the MLB without using large, costly cables. Furthermore, the second stage may be located within a shielded MLB enclosure to eliminate the need for any additional electromagnetic containment (EMC) measures. By generating power at an initial source and using that power to drive the main components of an all-in-one computer system, the cost of the system may be reduced and the design of the system may be simplified with an overall increased efficiency.

Figure 2 illustrates a basic block diagram of a power supply configuration in accordance with the teachings of the present invention. A flyback converter 205 provides power directly to a display 210, such as a CRT display. Flyback converter 205 may be located near display 210. Flyback converter 205 is coupled to a forward converter stage 215, which is located on or adjacent a MLB 220. In one embodiment of

the present invention, forward converter stage 215 is the final stage of a forward converter. Flyback converter 205 drives forward converter stage 215 via a connector 213, which may be, for example, a two wire bus. Thus, forward converter stage 215 is able to provide power to components, such as a CPU, on the MLB 220. Flyback converter 205 is able to provide power to display 210 and drive forward converter stage 215 such that power may be provided to components on MLB 220. Although it is not necessary to place forward converter stage 215 on or adjacent MLB 220, placing forward converter stage 215 on MLB 220 allows forward converter stage 215 to be located within an EMC enclosure coupled to MLB 220.

Although the present disclosure discusses the use of flyback converters and forward converters, it should be noted that flyback converters and forward converters are only examples of power supply components that may be used as part of the present invention.

Figure 3 illustrates a circuit diagram of a two stage power supply circuit according to one embodiment of the present invention. A first stage 300 includes a flyback converter and is capable of generating high voltages at low current. For example, 127V may be generated at 0.3A for the horizontal scanning and EHT generator, 80V may be generated at 0.2A for the video output, and 12V at 0.8A and 6.3V at 0.6A may be generated for the small signal processing. First stage 300 is associated with and provides power to a display device. A second stage 350 includes the final stage 355 of a forward converter and is capable of generating low voltages at high current. For example, 12V may be generated at 4A, 5V may be generated at 6A and 3.3V may be generated at 10A. Second stage 350 is associated with and provides power to components on a MLB. In one embodiment, first stage 300 and second stage 350 are located apart from each other but are electrically connected to each other by a two wire bus 325. Second stage 350 may be mounted directly onto the MLB to take

advantage of EMC features of the MLB, such as an EMC enclosure coupled to the MLB.

Diode 302 and capacitor 304 represent a bridge rectification and capacitive filter used to produce a high voltage DC supply for first stage 300. Resistor 306 is used to regulate the power used to start up first stage 300. Controller circuit 308 provides control and drive signals (base/gate drive signals) for switch 310. Transformer 312 is designed for flyback operation, as first stage 300 uses a flyback converter to generate power and drive second stage 350. Because transformer 312 is designed for flyback operation, first stage 300 can provide the voltages necessary to drive a display device. For example, a 6.3V output may be used for a CRT heater and a 127V output may be used for horizontal deflection. Furthermore, flyback converter can provide substantially constant output voltages over a wide range of load current and AC input voltages (e.g., 85 to 265V AC).

A secondary voltage is rectified by diode 314, and capacitor 316 acts as a capacitive filter. Voltage feedback, which is a portion of the output voltage, is used by controller circuit 308 to control the on and off times of switch 310. The feedback voltage is developed across a resistor divider formed by resistors 318 and 320 such that the correct feedback signal for controller circuit 308 may be generated.

Two wire bus 325 is coupled to first stage 300 as a winding on flyback transformer 312 to drive the final stage 355 of a forward converter in second stage 350, which is located apart from first stage 300. In one embodiment, two wire bus 325 carries approximately 48V AC at high frequencies (e.g., 60 kHz to 100 kHz) and is differentially driven by flyback transformer 312. This provides an effective way to decouple first stage 300 and second stage 350 to account for common noise. A common ferrite or coil may be added into two wire bus 325 to block common current without affecting the performance of two wire bus 325. This helps to prevent EMI from leaking out of the EMC enclosure coupled to the MLB.

Transformer 352 is the input transformer of second stage 350. Using a transformer again helps to reduce common mode noise, particularly noise coming from the CPU supply lines going back to the flyback converter. Furthermore, by using a second transformer, the power supply circuit of the present invention may be used to generate regulated auxiliary output voltages, without any additional feedback control circuitry, if the windings of transformer 352 are phased for flyback operation.

A DC output voltage of second stage 350 is rectified by diode 354, and capacitor 356 acts as a capacitive filter. It should be noted that the load regulation for the DC output voltages of second stage 350 is typically only as good as the load regulation for normal flyback operation. A linear regulator may be used to improve load regulation. It should be further noted that a forward converter based design is used for second stage 350 such that the main supply voltages (e.g., 3.3V and 5V) of second stage 350 may be generated at higher load currents.

Winding 358 of transformer 352 generates a low voltage, high current output, while inductor 360 provides voltage regulation. Inductor 360 acts similar to a magnetic pulse-width modulator, providing voltage regulation by secondary pulse-width modulation. As soon as an output voltage attempts to exceed the voltage of Zener diode 362, switch 364 is moved to an ON position, which increases the reset time/current of the core. If an additional output voltage is desired, an additional winding and regulator circuit (e.g., components similar to those coupled to winding 358) may be added, or a split winding (see Figs. 5A and 5B) may be used.

Transformer 352 provides the appropriate energy level through the turn ratio between the input winding of transformer 352 and the output windings (e.g., winding 358) of transformer 352. In one embodiment, the output windings produce sufficient energy to ensure regulation with the minimum duty cycle of a 48V AC carried by two wire bus 325.

By using a flyback converter in a first stage of a power supply circuit to drive a portion of a forward converter in a second stage, the power supply topography for a computer system may be simplified and overall system efficiency may be improved. Because only the final stage of a forward converter is used in the second stage in one embodiment of the present invention, the second stage may be placed on the main logic board of a computer system, in closer proximity to the CPU. This eliminates the need to use a high current, common mode noise rejecting filter when connecting power cables to the main logic board. Any remaining common mode noise that is not cancelled by the transformer of the second stage may be addressed by placing a small filter on the input wires of the second stage.

Although **Figure 3** illustrates a two stage power supply circuit, it is appreciated that the present invention is not limited to having only two stages. A number of stages may be used as long as at least one stage is driving one or more dependent stages.

Figure 4 illustrates generally an internal side view of an all-in-one computer system having a two stage power supply topography according to one embodiment of the present invention. A display device 410 is located adjacent a first PCB 420. A first power supply stage 425 is located on first PCB 420 and provides power to display device 410. In one embodiment of the present invention, first power supply stage 425 includes a flyback converter. An intermediate substrate 430 is located below first PCB 420. Substrate 430 forms the upper part of the EMC enclosure 450 and may also be used as a support plate and/or a heat exchanging plate. A main logic board 440 is located below intermediate substrate 430. A CPU is coupled to main logic board 440. An EMC enclosure 450 provides electromagnetic conformance for main logic board 440 and encloses a second power supply stage 460 mounted directly onto main logic board 440. Second power supply stage 460 provides power to the CPU and other components on main logic board 440. In one embodiment, second power supply stage 460 includes a final stage of a forward converter. A group of wires 470, such as a two

wire bus, connects first power supply stage 425 to second power supply stage 460 to allow first power supply stage 425 to drive second power supply stage 460. A housing (not shown) encloses all of the features shown in **Figure 4** and provides a viewing area for the screen of display device 410 to be viewed by a user.

Figure 5A illustrates one embodiment of a transformer which may be used in the first stage of a power supply circuit, such as the one shown in **Figure 3**. Transformer 500 has an input winding 510 configured as indicated. Output voltages are provided by output windings 520, 530 and 540. It should be noted that output winding 540 is a split winding and provides two different output voltages (12V and 6.3V). The relatively high output voltages of transformer 500 may be used to provide power to a display device. Output winding 545 provides the AC input for a two wire bus, such as two wire bus 325.

Figure 5B illustrates one embodiment of a transformer which may be used in the second stage of a power supply circuit, such as the one shown in **Figure 3**. Transformer 550 has an input winding 560 configured as indicated. Input winding 560 is one end of a two wire bus, which, for example, may connect transformers 500 and 550. Split winding 545 may be the other end of the two wire bus. Output voltages are provided by output windings 570 and 580. It should be noted that output winding 580 is a split winding and provides two different output voltages (5V and 3.3V). The relatively low output voltages of transformer 550 may be used to provide power to components (e.g., a CPU) on a MLB.

In the foregoing detailed description, the apparatus and method of the present invention have been described with reference to specific exemplary embodiments. However, it will be evident that various modifications and changes may be made without departing from the broader scope and spirit of the present invention. The present specification and figures are accordingly to be regarded as illustrative rather than restrictive.

CLAIMS

What is claimed is:

1. A power supply circuit for a digital processing system, the circuit comprising:

a first stage associated with a first component of the digital processing system; and

a second stage associated with a second component of the digital processing system, said second stage coupled to said first stage;

wherein said first stage drives said second stage.

2. The circuit of claim 1, wherein said first and second stages are separated from each other.

3. The circuit of claim 2, wherein said first and second stages are coupled to each other by a two wire bus.

4. The circuit of claim 3, wherein said two wire bus is differentially driven by said first stage.

5. The circuit of claim 2, wherein said first component comprises a display device and said second component comprises a microprocessor.

6. The circuit of claim 5, wherein said first stage is located proximately to said display device and said second stage is located proximately to said microprocessor.

7. The circuit of claim 1, wherein said first stage provides power for said first component and said second stage provides power for said second component.

8. The circuit of claim 7, wherein said first stage comprises a flyback converter and said second stage comprises a portion of a forward converter.

9. A power supply circuit for a computer system, the circuit comprising:

a first circuit capable of providing power to a first component of the computer system; and

a second circuit capable of providing power to a second component of the computer system;

wherein said first and second circuits are electrically coupled to each other.

10. The circuit of claim 9, wherein said first and second circuits are electrically coupled to each other such that said first circuit can drive said second circuit.

11. The circuit of claim 10, wherein said second circuit and said second component are disposed on a printed circuit board.

12. The circuit of claim 9, wherein said first circuit is located within an enclosure of the computer system and proximately to said first component, and wherein said second circuit is located within said enclosure and proximately to said second component.

13. The circuit of claim 12, wherein said first component comprises a display device and said second component comprises a microprocessor.

14. The circuit of claim 9 wherein said first circuit comprises a flyback converter and said second circuit comprises a final stage of a forward converter.

15. A computer system comprising:

a power supply circuit coupled to at least a display device and a microprocessor of the computer system, wherein said power supply circuit is capable of supplying power to said display device and said microprocessor using at least two distinct power supply stages.

16. The computer system of claim 15, wherein said power supply circuit comprises:

a main circuit coupled to one of said display device and said microprocessor; and

a secondary circuit coupled to the other of said display device and said microprocessor;

wherein said main circuit drives said secondary circuit.

17. The computer system of claim 16 wherein one of said at least two distinct power supply stages includes said main circuit, and wherein another of said at least two distinct power supply stages includes said secondary circuit.

18. The computer system of claim 16, wherein said main circuit and said secondary circuit are physically isolated from each other.

19. The computer system of claim 18, wherein said main circuit and said secondary circuit are electrically coupled to each other.

20. The computer system of claim 16, wherein said main circuit comprises a flyback converter and said secondary circuit comprises a portion of a forward converter.

ABSTRACT OF THE DISCLOSURE

A power supply circuit for a digital processing system. A first stage of the power supply circuit is used to generate power for a first component of the digital processing system and to drive a second stage of the power supply circuit. The second stage of the power supply circuit supports a second component of the digital processing system. The first and second stages of the power supply circuit are electrically connected to each other.

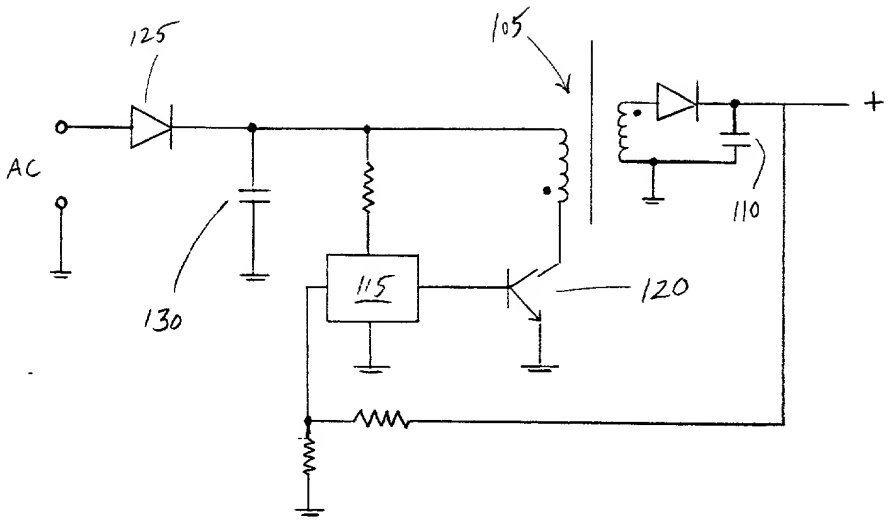


FIG. 1A
(Prior Art)

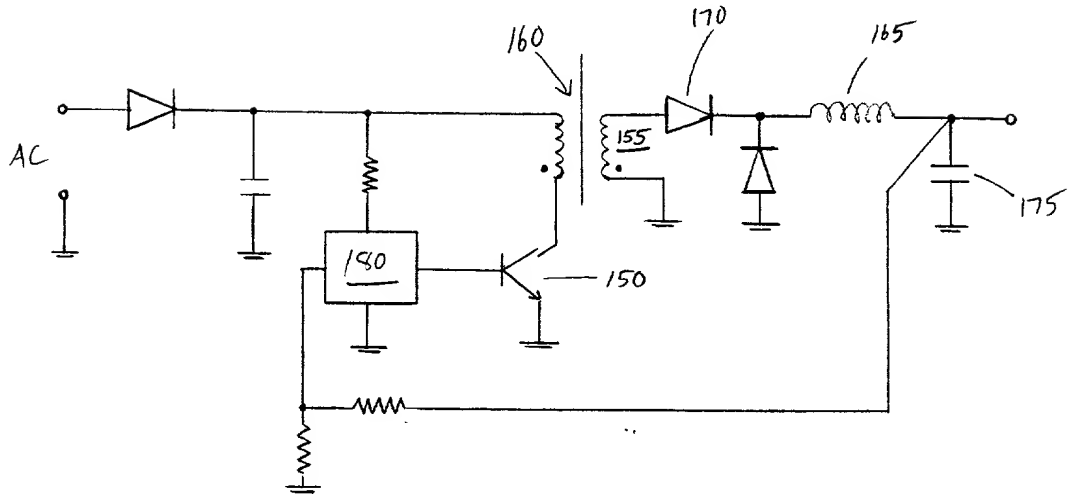


FIG. 1B
(Prior Art)

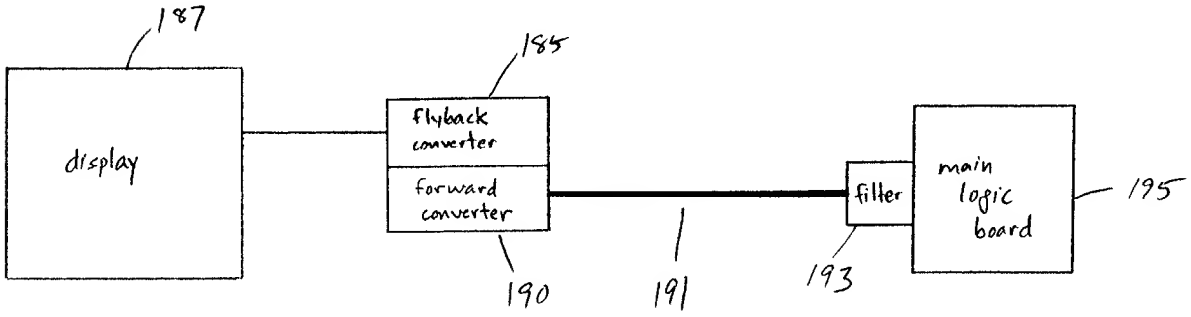


FIG. 1C

(Prior Art)

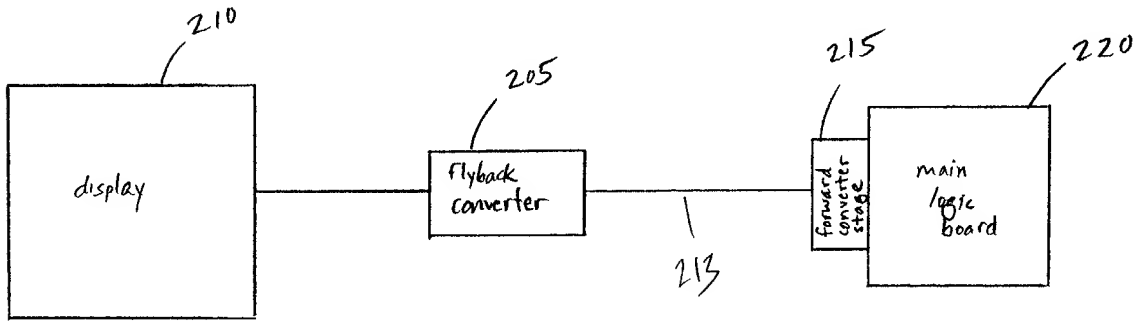


FIG. 2

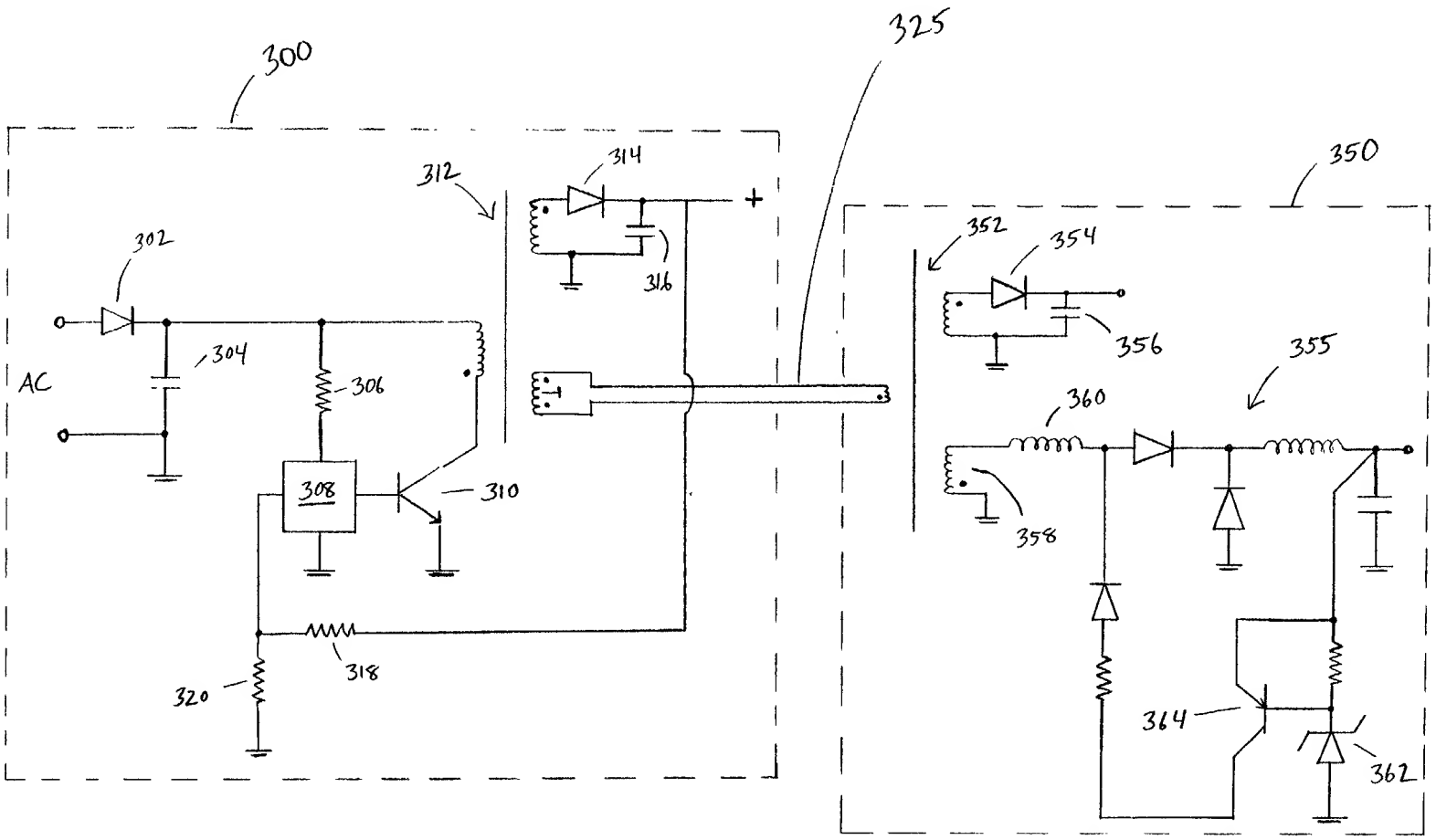


FIG. 3

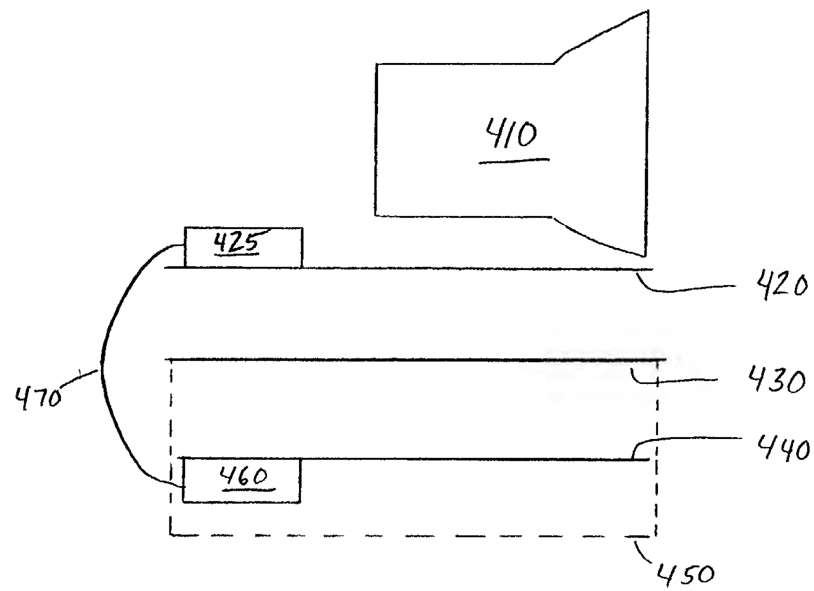
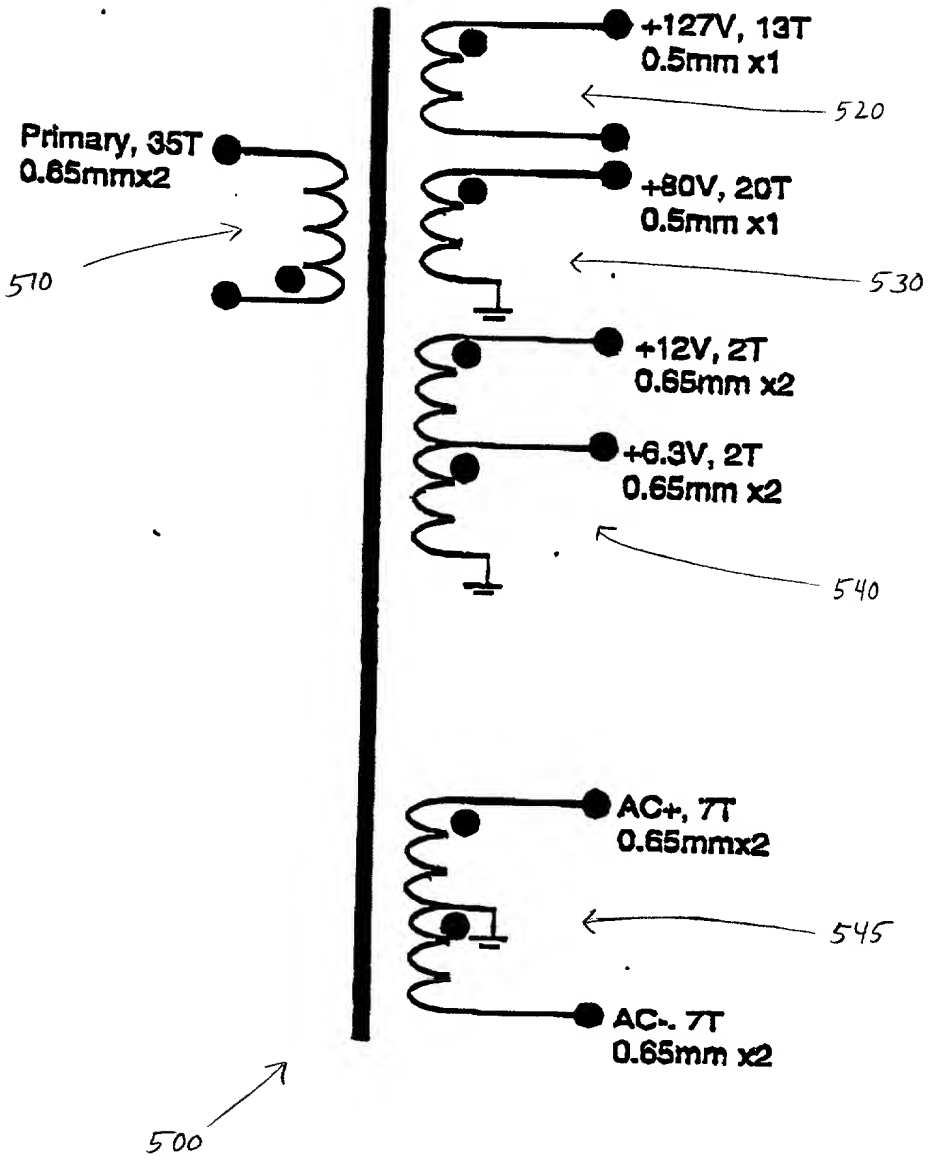


FIG. 4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AC-. 7T
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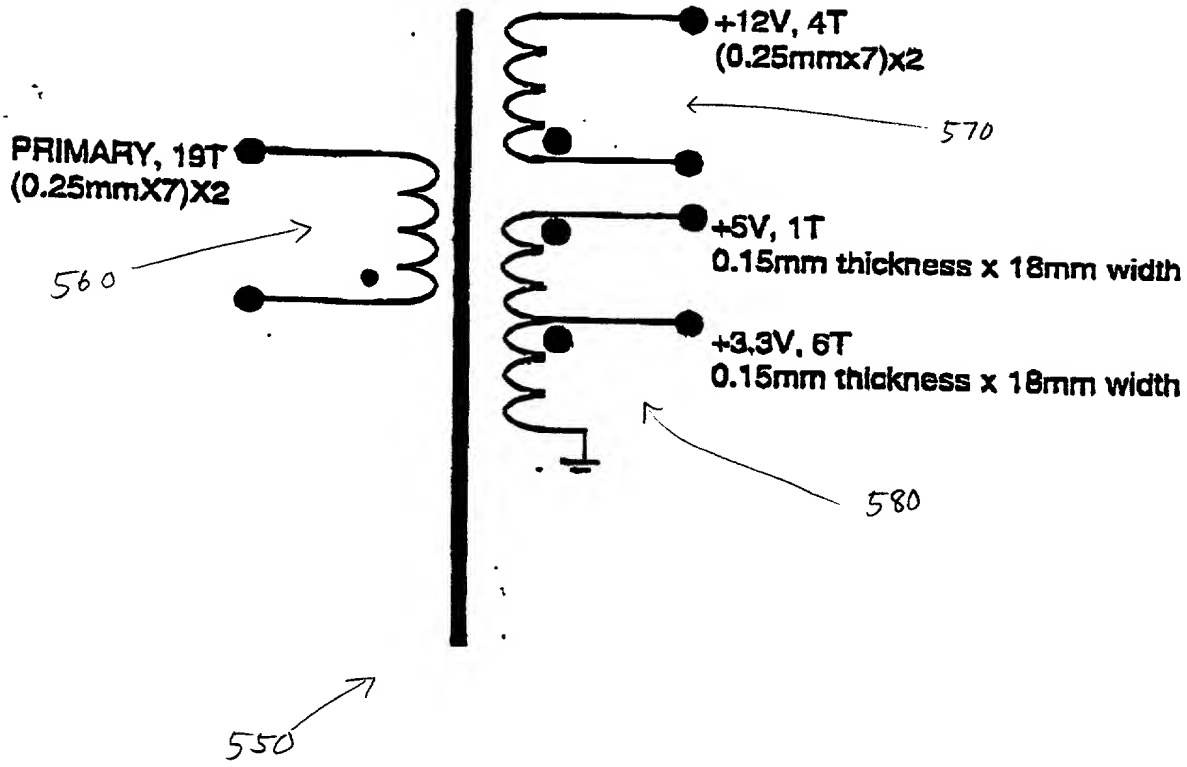
500

FIG. 5A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+3.3V, 6T
0.15mm thickness x 18mm width
580
550

FIG 5B

Attorney's Docket No.: 004860.P2449 Patent

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

POWER DISTRIBUTION SYSTEM

the specification of which

_X_ is attached hereto.
___ was filed on _____ as
United States Application Number _____
or PCT International Application Number _____
and was amended on _____ .
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

(Application Number)	Filing Date
(Application Number)	Filing Date

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Number)	Filing Date	(Status -- patented, pending, abandoned)
(Application Number)	Filing Date	(Status -- patented, pending, abandoned)

I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

Send correspondence to **James C. Scheller, Jr.** (Name of Attorney or Agent), BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP, 12400 Wilshire Boulevard 7th Floor, Los Angeles, California 90025 and direct telephone calls to **James C. Scheller, Jr.** (Name of Attorney or Agent), (408) 720-8598.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's Signature Peter Krause Date 28 Aug 2000

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APPENDIX A

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APPENDIX B

Title 37, Code of Federal Regulations, Section 1.56
Duty to Disclose Information Material to Patentability

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclosure information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclosure all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) Prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) The closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made or record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application;

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.